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LUBRICANT

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This invention relates to lubricants and per-
tains more particularly to a lubricating com-
pound or composition which is suitable for gear
lubrication, particularly where high pressures
5 are encountered, and which is also useful in all
types of machines wherein, due to severe condi-
tions of temperature and wear, it is desirable to
have incorporated in the lubricant a component
which will form an efficient lubricating film and
10 will not break down under hard service.

It is an object of the invention to produce a
lubricant having incorporated therein a finely
divided solid constituent, such as lead sulfide,
and to provide a mixture having such consistency
15 that the solid constituent may remain in suspen-
sion under normal conditions but under severe
service conditions may deposit, on the bearings
and other moving parts with which it is in con-
tact, a film that will reduce friction and prevent
20 scoring and seizure.

The method of preparing my improved lubri-
cant comprises reacting a lead soap with sulfur
to precipitate finely divided lead sulfide therein
and then dispersing the resultant mixture in a
25 hydrocarbon oil. I have discovered that when
a lead soap and sulfur are subjected to a suffi-
ciently high temperature, the soap is decomposed
by the sulfur and there is produced a precipitate
consisting of very fine particles of lead sulfide.
30 The sulfur will obviously precipitate a relatively
large amount of lead sulfide due to the high
molecular weight of the lead; however, I prefer
to use only enough sulfur to precipitate a por-
tion of the lead and to permit the remainder
35 of the soap, which is also a good lubricant, to
remain unreacted.

The lead soap used, according to the invention,
may be prepared by methods described in the
literature and preferably by the so called "dry
method" wherein litharge is reacted with a hot
40 fatty oil or fatty acid. Lead soaps which have
been found to be suitable comprise the lead soaps
of animal oils, vegetable oils and naphthenic
acids. I prefer, however, for economic reasons,
45 to use lead oleate or the lead soaps of certain
fish oils, such as menhaden oil.

The lead sulfide is precipitated in the soap
by heating the soap to suitable temperatures,
say from 250° F. to 450° F. and preferably in
50 the region of 300° F.—350° F., then adding the
sulfur thereto and agitating the mixture for a
sufficient time to insure the desired reaction.
Usually about one-half hour to three hours is
sufficient to produce complete reaction. It will
55 be understood, however, that the above condi-

tions are only by way of example and that the
method may be varied according to the type of
soap under preparation. In some cases it may
be desirable first to mix the sulfur and soap to-
gether and then heat the mixture to the proper
60 temperature, or it might be advantageous to add
the sulfur to the hot oil in batches, or gradually
add the sulfur after the mixture is at a suitable
temperature.

The amount of sulfur used to precipitate the
65 lead sulfide will vary somewhat according to the
type of lubricant under preparation. In general,
however, it has been found that an amount of
sulfur ranging from 0.25% to 5.0% of the weight
of the soap is satisfactory for ordinary pur-
70 poses and preferably about 1% of sulfur by
weight. The corresponding quantity of lead sul-
fide would range from approximately 1.9% to
37.5% of the soap and 7.5% by weight in the
case of the preferred amount. 75

The soap and precipitated lead sulfide are in-
corporated in the oil by any suitable means such
as agitating the two in a tank or kettle. The
materials are preferably mixed hot, although this
is not always necessary, in order to lower the vis-
80 cosity and hasten the mixing operation. A suit-
able temperature for the mixture may range from
100° F.—300° F., or the materials may be mixed at
approximately the same temperature as that at
which the soap is prepared or at which the lead
85 sulfide is precipitated therein.

While an operation has been described in which
a mixture of the soap and precipitated lead sul-
fide are first prepared and the mixture then in-
90 corporated in the oil, it will be understood that
the invention is not limited to such a procedure.
Instead, the soap may be dissolved in the oil first
and then lead sulfide precipitated by addition of
sulfur to the oil-soap mixture to produce the lead
95 sulfide in situ.

The kind of oil suitable for use as a solvent for
the soap and in which to suspend the lead sulfide
may vary within quite wide limits, for example,
from a low viscosity oil, such as 70 viscosity stock
100 at 100° F., to heavy residues such as those which
have been used heretofore in gear compounds
and car oils. It is preferred that the oil be heavy
enough to provide substantial lubricating quali-
ties and also to have sufficient consistency that
the lead sulfide will remain for considerable time
105 in suspension. It will be observed that I may use
any lubricating oil, but in the preparation of gear
compounds I prefer to use a heavy oil, such as a
crude residuum or blends thereof with various
lighter lubricating oils. 110

When adding a soap which already contains the lead sulfide in suspension, I add about 4%-30% by weight of the mixture to the oil. This quantity corresponds to about 0.01% to 1.5% added sulfur or in the region of 0.1%-10.0% lead sulfide. In the preparation of high pressure gear lubricants for example, I prefer to use about 10%-20% of the prepared soap mixture in a crude residuum, or in other words, about 0.025% to 1.0% of added sulfur or about 0.2%-7.0% of lead sulfide.

My improved lubricant has the advantage that it contains a soap which enhances the lubricating property and particularly a finely divided solid constituent which will provide a lubricating film under extreme pressures and severe conditions of temperature and of wear. The lead sulfide is finely divided whereby a uniform and smooth deposition of the particles on the bearing may be obtained to produce a continuous lubricating film. The size of the lead sulfide particles in normal operations may range from 8-25 microns, although in some cases much smaller sizes may be obtained, such as approaching or having colloidal dimensions.

Obviously many modifications and variations of the invention, as hereinbefore set forth, may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

What I claim is:

1. The method of preparing lubricants which comprises reacting a lead soap with sulfur whereby finely divided lead sulfide is precipitated in the soap and then dispersing the resulting mixture in a hydrocarbon oil.

2. The method of preparing lubricants which comprises subjecting a lead soap and sulfur to a temperature sufficient to precipitate finely divided lead sulfide in the soap and then mixing the resulting mixture of soap and lead sulfide with a lubricating oil.

3. The method of preparing lubricants which comprises heating a lead soap to a temperature of 250° F.-450° F., adding sufficient sulfur thereto to react with a portion of the lead in the soap, maintaining said temperature for a sufficient time to cause substantial precipitation of lead sulfide in the soap and then mixing the resultant mixture with a lubricating oil.

4. The method of preparing gear lubricants

which comprises subjecting a lead soap and 0.25%-5% by weight of sulfur to a temperature of 250° F.-450° F., thereby precipitating a portion of the lead in the soap as finely divided lead sulfide and then incorporating the resultant mixture in a heavy hydrocarbon oil.

5. The method of dispersing finely divided lead sulfide in a lead soap which comprises subjecting a lead soap to a temperature of 250° F.-450° F. and while so heated adding 0.25%-5% by weight of sulfur thereto and agitating the mixture to cause precipitation of finely divided lead sulfide and to effect uniform dispersion thereof throughout the mass.

6. A composition of matter comprising a hydrocarbon oil, lead soap and finely divided lead sulfide, the mixture having such consistency as to be suitable for lubricating purposes.

7. A lubricant comprising a lubricating oil, lead soap and 0.01%-1.5% by weight of sulfur in the form of finely divided lead sulfide.

8. A gear lubricant, comprising a heavy hydrocarbon oil to which has been added about 10%-20% by weight of a lead-soap compound consisting of lead soap and 0.25%-5% by weight of sulfur in the form of lead sulfide.

9. A composition of matter comprising lead soap and 0.25%-5% sulfur as lead sulfide dispersed therein, the lead sulfide having a particle size of 8-25 microns.

10. A composition of matter having lubricating properties comprising a sulfurized mixture of a hydrocarbon lubricating oil and lead soap, said mixture containing a substantial amount of finely divided lead sulfide.

11. A lubricant comprising a sulfurized mixture of a hydrocarbon oil having lubricating properties and lead oleate, said mixture containing a substantial amount of finely divided lead sulfide.

12. A lubricant comprising a sulfurized mixture of a hydrocarbon lubricating oil and lead naphthenate, said mixture containing a substantial amount of finely divided lead sulfide.

13. A composition of matter comprising a hydrocarbon oil having lubricating properties, lead oleate and finely divided lead sulfide.

14. A composition of matter comprising a hydrocarbon oil having lubricating properties, lead naphthenate and finely divided lead sulfide.

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